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(54) Title of Invention: Exhaust Emission Control System for Variable Cylinder System Engines

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Specification

Title of Invention

Exhaust Emission Control System for Variable Cylinder System Engines

Claim(s)

An exhaust emission control system for a variable cylinder system engine comprised of a variable cylinder system control circuit that shuts off the fuel supply to at least one of the cylinder groups comprised of a specified number of cylinders depending on engine load; oxygen sensors and three-way catalysts that are provided in the exhaust passages of multiple cylinders belonging to the groups of multiple cylinders mentioned above to control the air-fuel ratio when the engine is operated under the partial cylinder mode; and an oxygen sensor and a three-way catalyst which are located in the merged section of the exhaust passages downstream of the exhaust passages mentioned above to control the air-fuel ratio when the engine is operated under the full cylinder mode; a unique feature of which is that the system is equipped with a switching device that switches the active cylinder group whenever the engine operating mode changes from full cylinder mode to partial cylinder mode.

Detailed Explanation of the Invention

This invention concerns the exhaust emission control system of variable cylinder system engines equipped with a variable cylinder control system that varies the number of cylinders to which fuel is supplied depending on engine load, and an air-fuel ratio control system for exhaust emission control, whereby the switching is made between the inactive cylinder group and the active cylinder group whenever the engine runs under full cylinder mode; the purpose of which is to improve the driving feeling.

In general, whenever an engine is operated under a heavily loaded condition, engine fuel economy tends to improve. This is the reason for the use of a variable cylinder system for a multiple cylinder engine. When it is operated under a light load condition, the fuel supply to a partial group of its cylinders is shut off so that the load for the remaining active cylinder group can be increased by the load corresponding to the inactive cylinders. This results in a relative increase in load per cylinder

leading to improvement in the overall fuel economy of the engine.

On the other hand, there is a system known as an engine exhaust emission control means in which a three-way catalyst is installed in the exhaust system, while the oxygen concentration of the exhaust gas is detected to achieve feedback control of the air-fuel ratio to become approximately equal to the stoichiometric air-fuel ratio, so that the three-way catalyst can perform oxidation of HC and CO as well as reduction of NOx at the same time with high efficiency. When this particular exhaust emission control system is applied to a variable cylinder system engine, especially under a partial cylinder mode when a partial group of its cylinders is made inactive, the oxygen concentration in the exhaust gas becomes excessively high and different from that in the actual active cylinders supplied with fuel. This results from air exhausted from the inactive cylinders without combustion, which forces the control to decrease the air-fuel ratio.

In order to circumvent this problem, oxygen sensors and 3-way catalysts are installed separately for the split exhaust passages, one for the active cylinder group and the other for the inactive cylinder group, so that the air-fuel ratio can be feedback-controlled independently of each other group of cylinders, while the feedback control can be stopped for the inactive cylinder group during the partial cylinder mode.

This system has the problem that the three-way catalyst in the inactive cylinder group is cooled during the partial cylinder mode by the exhaust air. When this partial cylinder mode is continued for a long time, the catalyst temperature becomes lower than the activation temperature needed for catalytic reaction, leading to a potential inability to achieve the required reaction efficiency when the engine running condition calls for the full cylinder mode.

In order to address this problem, the inactive cylinder group is alternated with the active cylinder group during engine operation, instead of being inactive all the time, in such a manner that the use frequency of the three-way catalyst is made to be equal between the active and inactive cylinder groups.

This method, however, requires frequent switching between the cylinder groups depending on the relationship with respect to the catalyst temperature, requiring switchovers even during the partial cylinder mode resulting in discontinuous combustion relative to the ignition sequence, which leads to a potential deteriorating driving feeling (shock generation) during the switchover period.

In order to address these problems, this invention is designed to improve the driving feeling of a variable cylinder system engine by installing oxygen sensors and three-way catalysts at the exhaust passages of the active cylinder group and in-active cylinder group, and installing a three-way catalyst and an oxygen sensor in the merged section of the exhaust passage downstream of the exhaust passages from the two groups of cylinders mentioned above. In this manner, even during the partial cylinder mode, the temperature of the three-way catalyst in the merged passage can be maintained at an acceptable degree even during the partial cylinder mode so that the switching between the inactive cylinder group and active cylinder group can be made when the engine operation is switched from the full cylinder mode, during which the driving feeling has not deteriorated, to the partial cylinder mode. Next, during the partial cylinder mode, the inactive cylinder group is switched to the active cylinder group. In this manner, the system invented herein can provide switching between the active and inactive cylinder groups in the multi-cylinder variable cylinder system engine that satisfies both the exhaust emission control performance and the smooth driving requirement.

Explained below using drawings are working examples of this invention.

In these working examples, an electronically controlled 6-cylinder fuel injection engine is used in which the number of fuel-supplied cylinders is controlled by the pattern indicated in Fig. 2.

In Fig. 1, 1 is the engine, 1a is the intake passage, 1b and 1c are the divided exhaust passages for cylinders $\phi 1 \sim \phi 3$ and cylinders $\phi 4 \sim \phi 6$, respectively, and 1d is the merged exhaust passage of these two divided passages.

Located in exhaust passages 1b, 1c, and 1d are three-way catalysts, 2, 3, and 4, respectively, and oxygen sensors, 5, 6, and 7, respectively. The outputs from oxygen sensors 5 ~ 7 are, as indicated in Fig. 3, sent to a fuel injection control circuit (EGI circuit, hereafter), 11, through an air-fuel ratio control circuit, 17, from a switching circuit, 16, as the air-fuel ratio correction signal. As explained later, the air-fuel ratio of the air-fuel mixture supplied to the engine is feedback controlled to be approximately equal to the stoichiometric air-fuel ratio.

EGI circuit 11 described above outputs the fuel injection signal simultaneous with the engine rpm, having a pulse width corresponding essentially to the intake airflow that is based on outputs from engine intake air flow rate sensor 9 and engine speed sensor 10. This output signal is corrected by the

feedback signal, mentioned above, before it is supplied to fuel injection valve 13 for $\phi 1 - \phi 3$ cylinders and fuel injection valve 14 for $\phi 4 - \phi 6$ cylinders through the variable cylinder system control circuit (VCS circuit, hereafter), 12.

VCS circuit 12 mentioned above performs the control function, as indicated in Fig. 2, in such a manner that it selectively shuts off the fuel supply to cylinders $\phi 1 - \phi 3$ or to cylinders $\phi 4 - \phi 6$ under a light engine load condition, and supplies fuel to all cylinders (6 cylinders) under a heavy load condition. The status-quo region (in Fig. 2) represents the hysteresis region for preventing hunting during the period when the cylinder groups are switched over.

Based on the signal from the throttle switch, 8, the full cylinder mode restoration rpm is decreased from N_0 to N_0' during the time the throttle valve is fully closed.

VCS circuit 12 is configured as that shown in Fig. 4. In this figure, 25 and 26 pulse width comparators, which compare the output of comparison standard voltage generator 27 for a heavy load (P_{wH}) and the output of comparison standard voltage generator 28 for a light load (P_{wL}), with the output of the fuel injection pulse signal, P_w . If the latter is greater than the respective standard values, VCS circuit 12 outputs the high level signal, "1." A flip-flop, 33, permits input of the output of comparator 25 to the J-terminal, and input of the output of comparator 26 to the K-terminal through a sign inverter, 29, so that the sign of these outputs are changed. The number of cylinders is determined based on the output of flip-flop 33. In principle, output Q becomes "1" for the 6-cylinder signal when $P_w > P_{wH}$, and output \bar{Q} becomes "1" for the 3-cylinder signal when $P_w < P_{wL}$.

A comparator, 31, to which the voltage, V_N , corresponding to the engine rpm is input through an F-V converter (frequency-voltage converter), 30, compares the V_N with output V_{N0} from the rpm standard voltage generator, 32. If it is found that $V_{N0} > V_N$ "1" is input to the S-terminal (set terminal) of flip-flop 33 so that output Q is restored to "1" for the 6-cylinder operation irrespective of pulse width P_w .

In addition, the rpm standard voltage generator 32, when the "fully closed" signal is input from throttle switch 8, switches its generated standard voltage from V_{N0} to V_{N0}' causing the rpm for the 6-cylinder restoration to decrease further.

Flip-flop 34 is designed to switch the inactive cylinder group over to the group consisting of $\phi 1 - \phi 3$ cylinders or to the group consisting of $\phi 4 - \phi 6$ cylinders every time the running condition becomes the

6-cylinder mode. Every time output Q of flip-flop 33 mentioned above becomes "1," outputs Q and \bar{Q} are mutually inverted in such a manner that if one becomes "1," the other becomes "0." By forcing outputs Q and \bar{Q} to be input to the "AND" circuits, 35 and 36, the group of inactive cylinders, for which the fuel supply is cut-off, is switched. When the output of \bar{Q} of flip-flop 33 becomes "1," either outputs Q or \bar{Q} of flip-flop 34, whichever outputs the signal "1," opens the gate. This leads to the sending of "1" for the 3-cylinder signal to the normally closed analog switches (normally closed relay), 37 or 38, to open the relay contact point.

Analog switch 37 is inserted into the circuit that provides the fuel injection signal to fuel injection valve 13 for $\phi 1 - \phi 3$ cylinders, while analog switch 38 is inserted into the circuit that provides the fuel injection signal to fuel injection valve 14 for $\phi 4 - \phi 6$ cylinders.

Consequently, since output \bar{Q} of flip-flop 33 is "0," during the 6-cylinder operation, both analog switches 37 and 38 are in the state in which the relay contact points are closed. If, however, the 3-cylinder signal "1" is output as output Q, the relay contact point of either one of analog switches 37 or 38 is turned off, causing the operation of either the $\phi 1 - \phi 3$ cylinder group or the $\phi 4 - \phi 6$ cylinder group to become inactive.

As explained earlier, this switching is achieved only during the 6-cylinder operation because outputs Q and \bar{Q} are inverted to open either one of the gates for the AND circuits 35 or 36 alternately every time flip-flop 34 inputs "1," which is the 6-cylinder signal for output Q of flip-flop 33 in the previous step.

Next, the variable cylinder system control signals, a and b, from VCS circuit 12 are input to a delay circuit, 15, depicted in Figs. 3 and 5, to activate switching circuit 16 for the outputs of oxygen sensors 5 ~ 7.

Here, the normally closed analog switches (normally closed relays), 39 and 40, and 41 and 42, in switching circuit 16 are turned on when variable cylinder signals "a" and "b" become "1" (the exception being that switches 39 and 42 will be turned on when signals "a" and "b" become "0," because of the presence of sign inverters, 43 and 44.)

Consequently when the variable cylinder signals "a" and "b" mentioned above are input to switching circuit 16 through delay circuit 15 after a specified time delay, the output of oxygen sensor 5 or 7 is

selected corresponding to these signals before being input to comparator 18 in air-fuel ratio control circuit 17.

Specifically, since variable cylinder signal "b" is "1" when cylinders $\phi 1 - \phi 3$ are inactive, analog switch 40 is turned off while switch 39 is turned on. At the same time, since variable cylinder signal "a" is "0," analog switch 41 is turned on and switch 42 is turned off, causing the output of oxygen sensor 5 to be selected to perform feedback control of the air-fuel ratio, which is explained later, for $\phi 4 - \phi 6$ cylinders.

Similarly when cylinders $\phi 4 - \phi 6$ are inactive, analog switches 40 and 41 are turned on to perform feedback control of the air-fuel ratio for cylinders $\phi 1 - \phi 3$ based on the output from oxygen sensor 6 for cylinders $\phi 1 - \phi 3$. During the full cylinder operation, only analog switch 42 is turned on to perform feedback control for all cylinders based on the output of oxygen sensor 7 located in merged passage 1d.

The reason a specified time delay is provided for switching the outputs of oxygen sensors 5 ~ 7 is to take into consideration the time needed for the combustion gas to reach oxygen sensors 5 ~ 7 during the cylinder switching period. If switching circuit 16 is activated simultaneously with the cylinder switching, although momentarily, there is a possibility that the oxygen concentration of the exhaust gas from the inactive cylinders will be detected. This would lead to creating a potential risk of causing confusion in the feedback control as indicated earlier. The time delay assures that this problem will be prevented from occurring.

Next, air-fuel ratio control circuit 17 is designed to output an air-fuel ratio correction signal to EGI circuit 11 mentioned earlier based on the output of oxygen sensors 5 ~ 7 so that the feedback control is performed to obtain an air-fuel ratio close to the stoichiometric air-fuel ratio.

Number 19 represents a standard voltage generator that outputs the standard voltage corresponding to the stoichiometric air-fuel ratio, while number 18 is a comparator that compares this standard voltage with the output of the oxygen sensors mentioned above. Number 20 represents a correction circuit that outputs a correction signal based on deviation of the outputs of comparator 18 and the established standard signal. Number 22 represents, as described later, a clamp (*phon*) circuit to hold the output value at a constant value by interrupting the feedback control based on the outputs of monitor circuit

21 that determines the output condition of the oxygen sensors, and based on the full throttle signal from full throttle switch 24, or based on the fuel-cut signal during deceleration. In addition, monitor circuit 21 activates clamp circuit 22 to interrupt the feedback control as mentioned above when the temperatures of oxygen sensors 5-7 become too low to generate an appropriate output, or when the start signal is received from the starter switch, 23.

With the configuration explained above, when cylinders $\phi 1 \sim \phi 3$ are active, air-fuel ratio feedback control is performed based on the output of oxygen sensor 6, which permits fuel injection valve 13 to inject fuel so that an air-fuel mixture close to the stoichiometric value can be supplied to cylinders $\phi 1 \sim \phi 3$.

Consequently, three-way catalyst 3 can achieve high efficiency oxidation of HC and CO as well as reduction of NOx at the same time.

For the other three-way catalyst, 2, during this period, since the exhaust air from cylinders $\phi 4 \sim \phi 6$ is flowing into it, there is a possibility that its temperature might decrease. But, for three-way catalyst 1 located downstream, since the mixture of the combustion exhaust gas from cylinders $\phi 1 \sim \phi 3$ and the non-combustion exhaust gas from cylinders $\phi 4 \sim \phi 6$ is flowing into it, the temperature reduction will be relatively lower than that of three-way catalyst 3 located upstream. As a result, when the engine operation is shifted to the full cylinder mode, and even when the reaction of three-way catalyst 2 for cylinders $\phi 4 \sim \phi 6$ is low, three-way catalyst 4 in merged passage 1d can instantly achieve a highly efficient reaction.

Needless to say, feedback control of the air-fuel ratio can be achieved at the same time based on the output of oxygen sensor 7 located in merged passage 1d.

Moreover, since cylinder group switching is performed for every 6-cylinder operation, when it is followed by the 3-cylinder operation, the group consisting of cylinders $\phi 4 \sim \phi 6$, which has been inactive, becomes active while the group consisting of cylinders $\phi 1 \sim \phi 3$ becomes inactive.

Since cylinder group switching is performed in this manner, except when the partial cylinder operation lasts for a very long time, there is almost no possibility that the temperatures of upstream three-way catalysts 2 or 3 will decrease significantly.

Moreover, during the full cylinder operation, the purification (reaction) of harmful components in the exhaust gas takes place not only in downstream three-way catalyst 4, but also in upstream three-

way catalysts 2 and 3. This actually results in a marked decrease in the load on three-way catalyst 4, which permits decreasing the capacity of three-way catalyst 4.

Next, the working example shown in Fig. 6 is a system in which the generated voltage is switched by inputting variable cylinder signal "a" to standard voltage generator 19' in such a manner that the target air-fuel ratio for feedback control during the 3-cylinder operation is slightly lower than the stoichiometric air-fuel ratio.

In addition, the working example shown in Fig. 7 is a system in which upstream oxygen sensors 5 and 6 are eliminated, air-fuel ratio feedback control is interrupted during the 3-cylinder operation, and the specified air-fuel ratio is set at a value that is slightly lower than the stoichiometric air-fuel ratio. In order to achieve this control, the feedback control is interrupted and it is switched to a rich air-fuel ratio when variable cylinder control signal "a" is input to a clamp circuit, 22'.

In all of these working examples, the air fuel ratio is set slightly lower than the stoichiometric value to achieve NOx reduction efficiency of the upstream three-way catalysts 2 and 3 as high as possible during the 3-cylinder operation, while at the same time HC and CO can be oxidized under a sufficient amount of oxygen at three-way catalyst 4 in the merged passage, which leads to further improvement of exhaust emission control efficiency.

As explained above, according to this invention, it is no longer necessary to switch the cylinder groups during partial cylinder operation, which tends to worsen the driving feeling, resulting in improvement in driving performance. There is also another outstanding effect, thanks to the activity of the three-way catalyst placed in the merged exhaust passage, of preventing temporary deterioration of the exhaust characteristics that tend to occur when the engine operation is switched from the partial cylinder mode to the full cylinder mode.

Brief Explanation of Drawings

Fig. 1 is an approximate plan view of this invention. Fig. 2 explains the variable cylinder control pattern. Fig. 3 is a block diagram of the variable cylinder system for working example No 1, while Fig. 4 is a block diagram of its variable cylinder system circuit. Fig. 5 is a block diagram of the switching circuit. Figs. 6 and 7 are block diagrams of the control systems for other working examples

of this invention.

- 1... Engine Body
- 1b and 1c... Exhaust Passage
- 1d... Merged Exhaust Passage
- 2, 3, and 4... Three-Way Catalysts
- 5, 6, and 7... Oxygen Sensors
- 11... Fuel Injection Control Circuit
- 12... VCS Circuit
- 15... Delay Circuit
- 16... Switching Circuit
- 17... Air-Fuel Ratio Control Circuit

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FIGURES

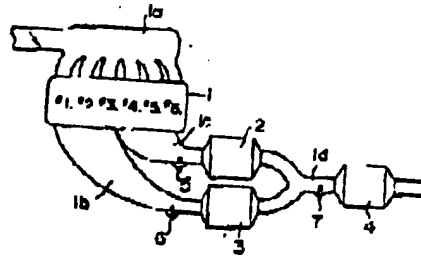


Fig. 1

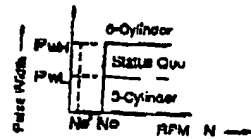


Fig. 2

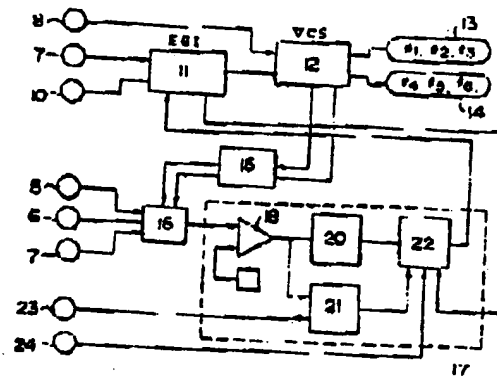


Fig. 3

FIGURES

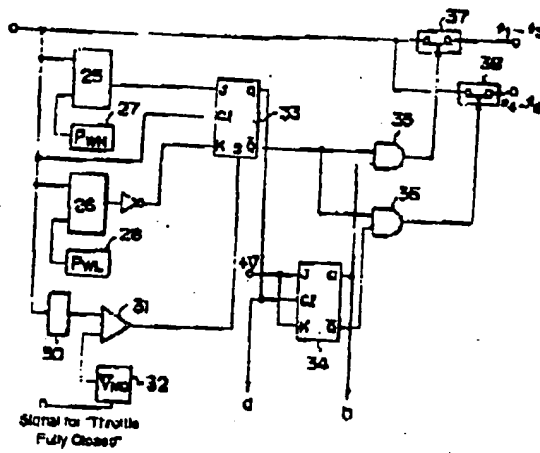


Fig. 4

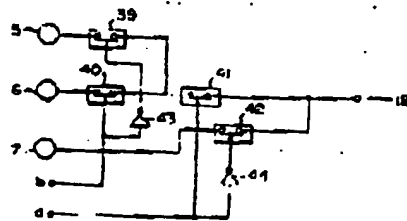


Fig. 5

FIGURES

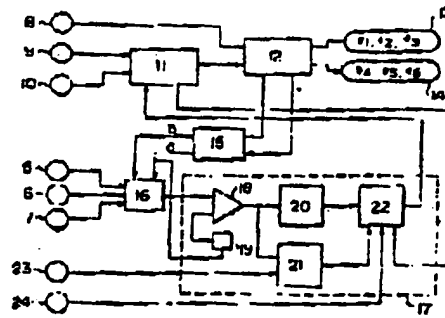


Fig. 6

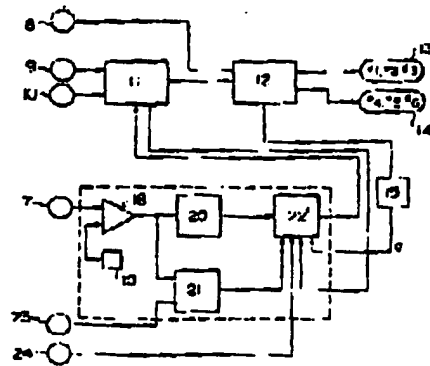


Fig. 7

●特許出願公開

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(全 6 頁)

④気筒数制御エンジンの排気浄化装置

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特 照 53-122287

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无利的心

式何世製利エソソソの詩気浄化機最

設計要求及範圍

[illegible]

另有說明書

本発明は、アンソンのようにして燃料供給装置を異質化せしめようとした燃料供給制御装置と、排気浄化のための排気比制御装置とを備えたエンジンに於いて、各装置を絶えずに停止・復帰と

第四生産グループの削減を行ふようにして、運輸・マシーナリヤを向上させた。前年度、新機・エンジン等の新機・エンジン等に關するものである。

一般的にユンゾンを高い音域で歌うと、聞き手が耳を痛める原因があり、このため、多分彼ユンゾルに代りてエンソン歌唱の小さな伏線で通唱するときは、一面歌唱グループに附する聴衆の行動を停止することとしよう行動を停止し、その分だけ静りの聴衆は彼グループの居る位置の静りの歌唱を聴取しに努め、全体としての聴衆の立場を越えようとなり、尤も同歌唱部エンソンが消えられた。

他方、エソソン特異現象の一手帳として、特異系に正交線形を配置するとともに、特異系の磁束形成を助けて磁束を凡て閉路磁束比にフィードバック制御し、正交磁束によりH.C. C.Oの動作とH.C.の磁束とを同時に磁束よく行うシステムが知られてゐるが、このシステムと互に互に保つて説明のメカニズムに適用する。とくに、一磁束グループの動作を説明している部分に磁束形成時に、

このため、炭素化合物の生産グループを一方にのみ限定したとせず、エンソノ組織中に炭素化

平明はかかる点に鑑み、低賃金制のメソッド
 の延長イーリングを志向するが、低賃金とセ
 ル賃金との差は過剰な冗員削減と低賃金メソ
 ッドを併用するとともに、その下で成長する低賃金
 にも同時に正元削減と低賃金を続け、低賃金
 制度でも成長過程の正元削減をもる制度の
 実行に維持することにより、低賃金グループと
 低賃金グループの両面から、低賃金イーリングの
 普及をいかに実現するかを最も重要視する
 点に行い、低賃金低賃金時に低賃金と
 グループと低賃金グループとを交代させること

そして、御遺跡跡14の14には、それゆゑに
元御跡2、3及び4と、同様にヤナシ、5及び7
が認められる。御跡ヤナシ7の地方は、高
野と云ふやうに、御遺跡跡14から取説は御遺
跡17を介して奥羽信濃國である能利實の御遺
跡14以下25の14と云ふことゝなり。聖徳太
祖信白王として通稱され、御遺跡跡14に、ヤ
シ御遺跡跡14の14と云ふことゝなり。ヤシ

言九郎ハヤトルユイヅサモカノ心算ナリト云リ、
ハヤトル全開助ニ以テ其爲難信用者知事ナリト云フ

No. へとを比較して下せる。

V C 3 回路 1 は具体的には第 4 図に示すよう
に構成されている。2 と 3 はパルス幅の比較
器で、高周波 (P_{HF}) に対応した比較器高周波
回路 2 と、低周波 (P_{LF}) に対応した比較器低
周波回路 3 の出力と、同期用パルス信号 P_{sync}
とを比較し、それぞれ基準電圧よりも大のとき K は
イレベル "1" を出力する。フリップフロップ 3
は、周子に比較器 2 の出力 P_{HF} 、また周子に比
較器 3 の出力 P_{LF} を符号反転器 2 を介して反転さ
れた出力がそれぞれ入力し、このフリップフロ
ップ 3 の出力にもとづいて高周波が決定され、基
準として $P_{HF} > P_{LF}$ のとき K は出力が高周波信号の
"1" となり、また $P_{HF} < P_{LF}$ のとき K は出力が低
周波信号の "1" とする。

また、 $P - V$ レーザ (高周波電圧発生器)
3 を介してアンテナ回路に接続した電圧 V_{ant} が
入力される比較器 1 は、高周波基準電圧 V_{HF} と
3 から出力 V_{HF} とを比較した上で、 $V_{HF} > V_{ant}$ の
とき "1" をフリップフロップ 3 の 5 端子 (セ

検出器 - 4954910)
ット端子) に入力して、パルス P_{sync} に関係なく Q
出力を "1" として高周波に決す。

また、上記比較器基準電圧発生器 3 はスロ
ットスイッチ 5 からの全周波信号が入力すると、同
基準電圧 V_{HF} から V_{HF} に切り替わり、5 端子へ
の作用図形をもちに下せる。

フリップフロップ 3 は高周波パルス発生
器グループを、01~03 と 04~06 とに 6 個
の値にそれぞれ割り当てるので、高周波フリップフ
ロップ 3 の Q 出力が "1" になる毎に、フリップフ
ロップ 3 の Q 出力と \bar{Q} 出力が互に反転して、
一方が "1" のとき他方が "0" とする。そして、
この Q 出力と \bar{Q} 出力とをアンテナ回路 3 と 5 へ
入力させて、その出力で高周波信号の周波数
グループを割り当てるのであり、フリップフロップ 3
の Q 出力が "1" の時にフリップフロップ 3 の Q
出力、又は \bar{Q} 出力のうちいずれか "1" を出力した
方のグループを回し、5 端子信号の "1" を高周波
パルススイッチ (高周波レー) 3 と 5、又は 0 5 に
供給してレーザ点を照く。

- 7 -

- 8 -

アナログスイッチ 3 と 5 は 01~03 の高周波
群 1 と、2 と 7 とアナログスイッチ 3 と 5 は 04~06
の高周波群 1 と、それ以外の高周波群 2 とを
検出する回路に導入される。

したがって、5 端子信号中はフリップフロ
ップ 3 の Q 出力が "0" のため、アナログスイ
ッチ 3、5 は高周波レーザ点を検出しない
が、 Q 出力としての高周波信号の "1" が出力され
ると、いずれか一方のアナログスイッチ 3 また
は 5 のレーザ点がオンとなり、01~03 と
又は 04~06 の高周波グループの作用が停止する。

とこので、この高周波は、高周波点の通り、
フリップフロップ 3 の高周波のフリップフロ
ップ 3 の Q 出力の 6 端子信号である "1" が入力する
毎に、その Q 出力と \bar{Q} 出力が反転してアンテナ
回路 3 と 5 のいずれか一方を全周波グループ
に入力する。高周波基準電圧 V_{HF} に入力されるので
ある。

次に、この V に 3 端子 1 と 5 からの高周波信号
を、1 と、2 と、3 とに示す高周波 1 と

に入力され、高周波信号 3 と 5 の出力の高周波
1 とを作用させる。

ここで、高周波 1 との高周波アナログスイ
ッチ (高周波レー) 3 と、01 と 02、03 とは、そ
れぞれ高周波信号 3 と 5 が "1" のときスイ
ッチオン (ただし符号反転器 3 と 5 が 0 5 ため、
スイッチ 3 と 5 は信号 3 と 5 が 0 5 のとき
スイッチオン) とする。

したがって高周波 1 とを介して高周波の
高周波 3 と 5、上記した高周波信号 3 と 5 が高周
波 1 とに入力すると、それに応じて高周波 3
と 5 の出力が選択されて高周波 1 との
比較器 1 とに入力されるのである。

具体的には 01~03 高周波が停止しているとき
は、高周波信号 3 と 5 のため、アナログスイ
ッチ 3 と 5 がオフとなり、スイッチ 3 と 5 がオンとな
ると、高周波信号 3 と 5 が "0" のため、アナ
ログスイッチ 3 と 5 がオフで、同じくスイッチ 3 と 5 が
オフとなるから、高周波 3 と 5 の出力が選択され
て、04~06 高周波に切り替えるように高周

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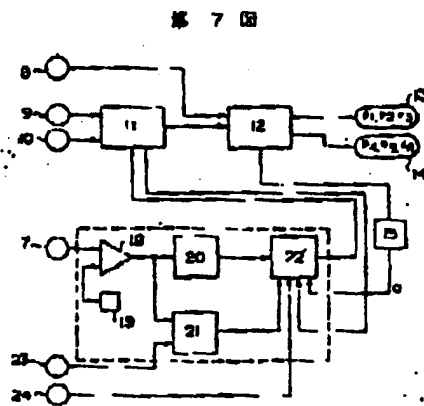
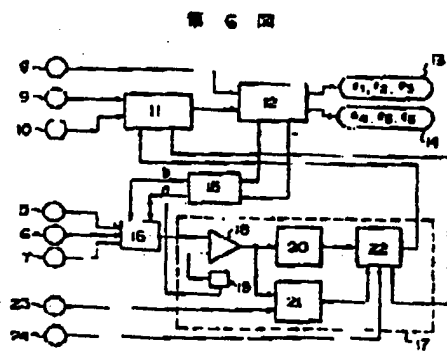
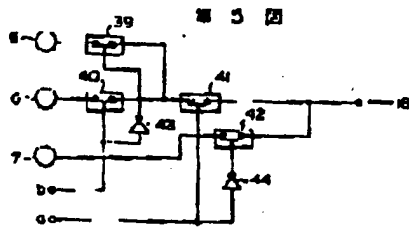
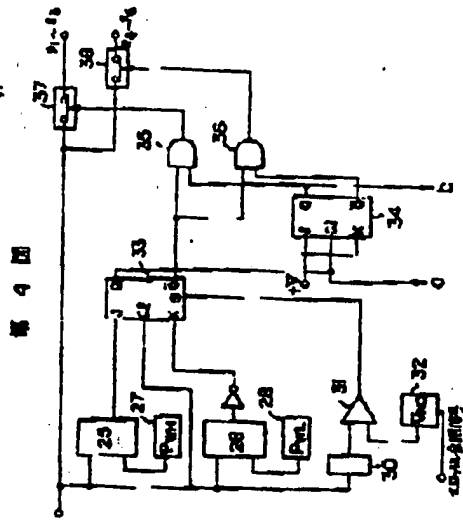
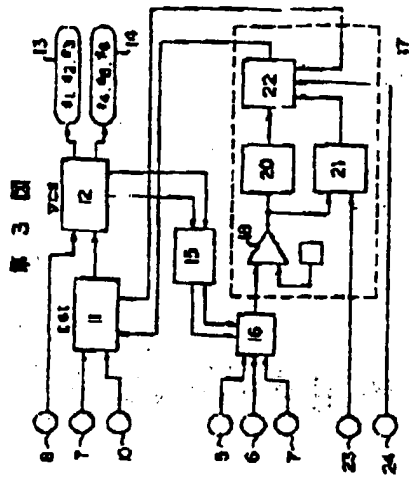
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次、中越北朝西四路17日、旅英モルサ5-
7の州刀をもとにして、肉肥身口(四路11)に列

以上のようにならべてある。第1～第3図

創設上のときは各院通稱として田舎でメサ？の
出力にもとづいて衆議院のクワイートベック創制が
行われる。

次に原稿に示す例は、3個の軸にアイソバツ軸の位置定数を明確に比より指定するに、矢張り、これを標準電圧を1に代入して、定電圧の値もものである。



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